David Trefftz
Universidad EAFIT
Colombia
ditrefftzr@eafit.edu.co

Federico Rafael Jaramillo
Universidad EAFIT
Colombia
fjaram18@eafit.edu.co

Mauricio Toro
Universidad EAFIT
Colombia
mtorobe@eafit.edu.co

ABSTRACT

The trend towards renewable energy has led to a need of optimization in the routing and electric consumption of electric cars in order to make it more efficient. Since the fossil fuels used in common vehicles damages the environment, electric cars have become a stronger alternative for transportation. Since it is still a newer technology, efficient ways to route and mobilize electric vehicles are of utmost importance in order to make them a viable option against the standard more common fossil fueled vehicles.

1. INTRODUCTION

Humanity has always thrived for the improvement of its kind, searching for new ways to stay on top and progress as a species. The industrial revolution brought many changes to many societies, it transformed the world. It brought machines and industrialization to the working class. Everything became efficient and easily produced thanks to machines. One of the most affected systems was transportation. Before the fastest way to get somewhere by land was riding an animal, but after industrialization, came trains and later cars, that permitted a quicker mobilization. This gave massive growth and productivity across all the globe. But all this came at a price, oblivious to humans back then. Machines need fuel to work, and we quickly became dependant on it. At first it was carbon, but we quickly changed to fossil fuels after we learned how much energy they could provide to us. Of course, humans didn't know how harmful fossil fuels could be to the environment, and once we realized it was a bit too late. Many things nowadays derives or work from fossil fuels, especially our transportation. It is up to these newer generations to rectify this problem, to change and better the world instead of harming it. Electric vehicles provide an option to a more cleaner way to get around, avoiding the consumption of fossil fuels. Yet, this solution is still not perfect. As stated before, fossil fuels store a great amount of energy, and compared to the efficiency, we can take out of electricity for motors the cost and use of it is not worth it in many cases. By optimizing and finding the best possible routes and ways to mobilize electric vehicles the gap between these two can be lessen, giving the electric vehicles more viability in modern society.

2. PROBLEM

There is a need to find an algorithm that finds the most efficient route from one place to another for electric vehicles, taking into consideration the different conditions that affects them. By doing so, the use of electric vehicles will rise and possibly overshadow other types of powering, if its efficiency surpasses them. This will lead to a healthier environment and a better use of resources.

3. RELATED WORK

3.1 The traveling salesman agent.

The traveling salesman problem has been quite known for system engineers for a long time. It consist´s on a salesman who wants to visit different customers but doesn't know wich is the most efficient route to do so. The most famous solution to the problem is to use an heuristic approach. turning the clients into vertex, and the distance between them as the weight. After that, the algorithm used to determine the best route is the nearest neighbours (greedy algorithm). This way the traveler will always visit the closest vertex to the one he is standing in. This solution probes to be very efficient timewise, but has a margen error up to 25% of the optimal solution.

3.2 Finding the optimal route between two nodes in a graph

The question of how to get to one place to another has been asked for many centuries. With the long timed introduction of maps, the question has turned to "How is the fastest way I can get to one place to another". The best solution found so far for this problem has been Dijkstra´s algorithm, that also turns the map into a graph and analyses, for levels, the route that has the less weight between one vertex and another.

3.3 Delivery system problem.

A lot of delivery enterprises have to problem of choosing how many delivery trucks should be sent to cover the least amount of time. Using a single vehicle for every delivery has been proven to be non effective, so the need for an algorithm that balances the time vs cost efficiency arises. Similar to the traveling salesman, this problem utilices an heuristic approach to determine the route of every truck, this time including the parameters of cost for the deliveries,

to check how many drivers should be sent and what route should they take.